UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 6 (6SF-AP)
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TECHNICAL MEMORANDUM

SUBJECT: Supporting Arguments for Proposed Remedial Alternative (i.e., Monitored Natural Attenuation with no Further Action for Source Zone) at the South Cavalcade Superfund Site, Houston, Texas
(EPA ID# TXD980810386)

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TO: South Cavalcade Superfund Site Files

BACKGROUND

The purpose of this technical memorandum is to present technical arguments to support the proposed Monitored Natural Attenuation (MNA) with no further action for source zone remedial alternative for the South Cavalcade Superfund Site. The site subsurface soils and ground water are affected by multi-phased contaminants – Dense Non-Aqueous Phase Liquids (DNAPL – i.e., creosote) and dissolved hazardous constituents. Contaminants have entered ground water, through historic creosote surface pits and drip tracks, and have formed subsurface DNAPL pools within ground water (creosote source) in some areas, which have developed dissolved constituent plumes onsite with very minor offsite contamination.

The approximate 66 acre wood treating plant operated from 1910 to 1962. Creosote was used as the primary wood preservative. The wood treating process area was located in the southern portion of the site along Collingsworth Street. Koppers Company, Inc. (Koppers), now known as Beazer, operated the wood treating facility from 1940 to 1962. A coal tar distillation plant was also operated by Koppers on the southern portion of the Site from approximately 1944 to 1962.

There are four subsurface creosote source and residual areas onsite, with a total area of approximately 34 acres. Two areas are located in the northern portion of the site and two in the southern portion. The northern portion generally corresponds to a former pond area, and the second is smaller and located more to the south of the most northern area – total area approximately 7 acres. Two areas of creosote source are located in the southern area; these

southern sources are much larger than the northern portion and correspond to the former wood treating process area and the former coal tar plant – total area approximately 27 acres. Dissolved constituent plumes are found extending a short distance westward, along the ground water flow path, from these source areas.

SUPPORTING ARGUMENTS

MNA is defined by the Environmental Protection Agency (EPA) as "the reliance upon natural attenuation processes (within the context of a carefully controlled and monitored site cleanup approach) to achieve site specific remediation objectives within a time frame that is reasonable compared to that offered by other more active methods." That is, natural attenuation refers to the natural chemical and physical processes that may control or degrade contaminants; while the term monitored natural attenuation (MNA) refers to the reliance upon natural attenuation processes to achieve the remedial goals. Natural attenuation processes include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or ground water. These in-situ processes include biodegradation, dispersion, dilution, sorption, volatilization, radioactive decay; and chemical or biological stabilization, transformation, or destruction of contaminants. EPA expects that MNA will be an appropriate remediation method only where its use will be protective of human health and the environment and it will be capable of achieving site specific cleanup remediation objectives within a time frame that is reasonable compared to other alternatives. The objective of MNA is to assure protection of receptors (human health and ecological) by monitoring the natural chemical and physical processes that may control or degrade contaminants.

The MNA remedial alternative is the most cost effective remedy at this point in the remedial process. The following arguments in support of MNA as a remedial alternative are presented in three sections: 1) response to the MNA requirements in the above paragraph, 2) investigative findings, and 3) application to the nine criteria.

Response to the MNA requirements:

1) Investigative data appears to indicate that natural attenuation processes, such as biodegradation, dilution, dispersion and sorption, may be active at this site and could achieve the remedial goals over time. Natural attenuation could achieve site specific remediation objectives within a time frame that is reasonable compared to that offered by other more active methods; specifically, the present remedy has removed only 1.6 percent of the source. In addition, other appropriate remedies will disturb present industry and are costly.

2) The objective of MNA is to assure protection of receptors (human health and ecological) by monitoring the natural chemical and physical processes that may control or degrade contaminants. Through controls, no receptors exist at this site at this time. Contaminated

ground water does not flow to surface water - the ground water table is approximately eight-feet below surface and no surface water bodies presently exist. Due to the low flow capacity of these aquifers, they are not used for drinking water purposes in this area; in addition, the source and dissolved plume exist on site where institutional controls (i.e., deed restrictions - no drilling) have been put in-place and accepted by the land owners.

Investigative Findings:

1) Site characterization at potential MNA sites involves determining the pathways of contaminant transport from source to receptor, and the factors that encourage or inhibit movement of contaminants from the source to receptor. Many soils and ground water investigations have been conducted over the years to define the volume, extent and mobility of the creosote source and dissolved ends. Creosote source and dissolved plume areas have been defined through the installation of many wells and collection of soil samples. Borings information supports the presumption that the source appears not to migrate. Evidence exists that sufficient information has been collected to support a remedy that will be protective of human health and the environment.

2) MNA remedies require an understanding of contaminant transport and fate of chemical contaminants in the subsurface. Soils and ground water data have been collected, and ground water analytical model simulations, which simulate the movement of ground water and the transport of contaminants over time, have been conducted and support the presumption that an MNA remedy is appropriate (Key Environmental documents: GFTER and VFGTER). Aquifer information indicate a low ground water gradient and ground water flow velocity, and therefore, low transport velocity. Historic ground water wells and borings information infer that the sources and dissolved plumes appear not to migrate; however, long-term monitoring (i.e., MNA) will be needed to document this over time.

3) Aquifer parameters support some biodegradation potential (a natural attenuation parameter). Comparison of the calculated dissolved contaminant transport distance to the actual relatively short transport distance from source material to the outer boundary of detected dissolved concentrations appears to support active natural attenuation (i.e., the dissolved ground water plume is found much closer to the source than the calculated distance the plume should have traveled).

4) Other Superfund creosote sites have applied active remedies. However, this site is unique, the major southern portion of the this site has major active trucking firms with concrete parking, a major highway and major railroad tracks; which presently do not afford the most applicable active (and consequently, costly) remedies such as excavation, stabilization-solidification or chemical oxidation.

   a) Although applicable remedies, excavation or stabilization-solidification would require managing contaminated soils to an approximate depth of 60 feet, which, at this point in

the available standard or innovative technologies, is impracticable.

b) Although an applicable remedy, due to the silty nature of the subsurface formations/aquifers, chemical oxidation would not be cost effective at this point in the remedial process, because many (densely packed) chemical oxidation injection wells would be required due to the small injection radius for each well.

Although these active remedies would affect several ongoing operations in the area, investigative data indicate that the MNA remedy is an acceptable alternative. The active alternatives are more appropriate for less industrialized areas. However, if long-term monitoring indicates that natural attenuation is not effective in supporting a stabilized source and dissolved plume, an active remedy will be implemented.

5) The present active DNAPL remedy – extraction wells/pump and treat – has proven to be ineffective. Pumping has been conducted for many years with dramatic decreasing creosote recovery volumes overtime; as the PRP has stated, only approximately 1.6 percent of the subsurface creosote mass has been collected, which is possibly due to the low permeability and deliverability of the formation. Therefore, the present remedy has proven not to be cost effective. A greater extraction well density would most probably recovery much more creosote source; however, this density would incur much greater cost, would encroach on industry, and would allow residual source to remain. Residual source would continue to source the aquifer with unacceptable levels of dissolved constituents, although at a much lower rate.

Application of the Nine Criteria:

Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to public health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of remedial alternatives using the nine remedy selection criteria specified in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and summarized in Table 1. This analysis provides the basis for making a statutory finding that the selected remedy uses a proven treatment technology as a principal element.

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site; the source at this site is the subsurface creosote product, which exists in "pools" in ground water. Source material is any material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to ground water, surface water, air, or acts as a source for direct exposure.

The contaminated subsurface soils and ground water in the source area represent both "principal threat waste" and "source material" because the primary Contaminants of Concern (COCs – creosote constituents) occur at concentrations that pose a significant risk as inferred from ground

water-quality monitoring data. Contaminated ground water generally is not considered to be a principal threat waste or source material; however, Non-Aqueous Phase Liquids (NAPLs – which in this instance is the creosote source) in ground water may be viewed as source material. Nine criteria (see Table 1) are used to evaluate the different remediation alternatives individually (detailed analysis) and against each other (comparative analysis) to facilitate a ranking of the alternatives and selection of the (overall) Preferred Alternative. This section generally compares the MNA remedy to the other possible active remedies available for subsurface creosote (source) contamination.

TABLE 2 - EVALUATION CRITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES
1. Overall Protectiveness of Human Health and the Environment - determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
2. Compliance with ARARs - evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.
3. Long-term Effectiveness and Permanence - considers the ability of an alternative to maintain protection of human health and the environment over time.
4. Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment - evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
5. Short-term Effectiveness - considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
6. Implementability - considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
7. Cost - includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
8. State/Support Agency Acceptance - considers whether the State agrees with the EPA's analyses and recommendations, as described in the RI/FS and Proposed Plan.
9. Community Acceptance – considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

Evaluation Criteria No. 1:

The active remedy, pump and treat, was found to be ineffective for source reduction unless many (densely packed) extraction wells would be used; however, industry would be impacted. Active treatment remedies would impact industry. No receptors exist at this time; MNA would control threats to the public health and the environment through institutional controls and monitoring.

Evaluation Criteria No. 2:

A waiver to the ARARs is justified for ground water. A Technical Impracticability (TI) Waiver will be developed to address those ARARs, which are affected by the MNA proposed alternative. The TI document will document the impracticability of removing the source material effectively without disturbing or removing existing industry.

Evaluation Criteria No. 3:

MNA has the ability to maintain protection of human health and the environment; characterization information suggests that natural attenuation appears to have the ability to remediate the subsurface area over time. No receptors have been identified at this time; MNA would control threats to the public health and the environment through institutional controls and monitoring.

Evaluation Criteria No. 4:

MNA will not directly use active treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present. However, in place of an active treatment, MNA is selected to monitor the natural degradation of the principal contaminants through natural attenuation processes such as, biodegradation, retardation and dilution, which will reduce toxicity, mobility, and volume of contaminants over time. A TI document will be developed to show the difficulty in removing the principal contaminants (i.e., creosote source material).

Evaluation Criteria No. 5:

MNA is not considered a short-term effective remedy; however, due to the density of industry in the area, the only subsurface active remedy, which would least disturb all industry, would be chemical oxidation. However, chemical oxidation would require many densely packed injectors, due to the silty nature of the aquifers. In addition, chemical oxidation would be time consuming and costly due to the volume of creosote source material in the subsurface. MNA would pose the least risk during implementation

Evaluation Criteria No. 6:

Compared to other active remedies, the MNA alternative has the least concern for the technical and administrative feasibility of implementation. Goods and services are readily available to implement the MNA alternative, more so than implementing other active alternatives.

Evaluation Criteria No. 7:

MNA is the least costly remedial alternative at this site, by many millions of dollars.

Evaluation Criteria No. 8:

The State of Texas supports the MNA alternative.

Evaluation Criteria No. 9:

The community issue applies to the site itself. The down-gradient/offsite western area contained residential property in the past; however, the Houston Transit Authority has purchased all residences within a block of the site boundary to construct a toll road extension. The majority of community concerns would come from owners of industry, which operate on and offsite.

SUPPORTING DOCUMENTS

Key Environmental Resources, Inc., March 1, 2006, Supplemental Groundwater Investigation Report, South Cavalcade Superfund Site, Houston, Texas

Key Environmental Resources, Inc., July 31, 2000, Verification of Groundwater Fate and Transport Evaluation, South Cavalcade Superfund Site, Houston, Texas

Key Environmental Resources, Inc., August 1997, Groundwater Fate and Transport Evaluation, South Cavalcade Superfund Site, Houston, Texas

Keystone Environmental Resources, Inc., July 1988, Final Report – Remedial Investigation, South Cavalcade Site, Houston, Texas

NCP Section 300.430(a)(1)(iii)(A)).